

CLAIMS

What is claimed is:

1. A tool for deploying an anastomosis device, comprising:
a crown, wherein the anastomosis device is connected to the distal end of said crown and
an expander configured to translate relative to said crown, said expander including an expander tip.
2. The tool of claim 1, wherein a plurality of slots are defined in said expander tip, said slots defining segments therebetween.
3. The tool of claim 2, wherein at least one of said segments is sized differently from at least one other said segment.
4. The tool of claim 2, wherein said expander tip has an axis, and said segments are biased away from said axis.
5. The tool of claim 2, further comprising an expander collet defined on said expander tip.
6. The tool of claim 2, wherein said segments are biased outward from the axis of said expander tip.
7. The tool of claim 2, wherein said at least one said segment has a different width than at least one other said segment.

8. The tool of claim 1, further comprising a casing, said crown and said expander configured to translate relative to said casing.

9. The tool of claim 8, further comprising a contact structure at the distal end of said casing.

10. The tool of claim 8, further comprising a hollow introducer tip connected to said casing.

11. The tool of claim 8, further comprising an introducer tube slidably mounted within said casing, wherein said crown and said expander are slidably mounted within said introducer tube.

12. The tool of claim 11, further comprising a seal chamber connected to the distal end of said introducer tube.

13. An integrated anastomosis tool for connecting a graft vessel to a target vessel, comprising:

a first mechanism configured to create an opening in the target vessel;

a second mechanism configured to complete an anastomosis with the target vessel; and

a single control configured to operate both said first mechanism and said second mechanism.

14. The integrated anastomosis tool of claim 13, wherein said first mechanism and said second mechanism are located outside the lumen of the graft vessel.

15. The integrated anastomosis tool of claim 13, wherein said single control is a knob.

16. The integrated anastomosis tool of claim 15, wherein said knob is rotated in a single direction to operate both said first mechanism and said second mechanism.

17. The integrated anastomosis tool of claim 13, further comprising a cam cylinder connected to said single control, said cam cylinder including at least one cam path.

18. The integrated anastomosis tool of claim 17, wherein said first mechanism and said second mechanism each include at least one cam follower configured to engage at least one said cam path on said cam cylinder.

19. The integrated anastomosis tool of claim 17, further comprising a safety switch configured to selectively engage said cam cylinder to prevent substantial rotation of said cam cylinder.

20. The integrated anastomosis tool of claim 17, further comprising a casing at least partially enclosing said first mechanism and said second mechanism, wherein said cam cylinder is located at least partially within said casing.

21. The integrated anastomosis tool of claim 20, wherein said casing includes a stop defined thereon, and wherein said cam cylinder includes a notch configured to engage said stop.
22. The integrated anastomosis tool of claim 13, further comprising a hemostasis chamber through which both said first mechanism and said second mechanism travel.
23. The integrated anastomosis tool of claim 13, wherein at least a part of said first mechanism is moved along a first axis to create the opening in the vessel wall, and wherein said at least a part of said first mechanism is configured to move away from said first axis before said second mechanism deploys said anastomosis device.
24. The integrated anastomosis tool of claim 13, wherein at least a part of said first mechanism is moved along a first axis to create the opening in the vessel wall, and wherein at least a part of said second mechanism is moved from a position away from said first axis to align with said first axis before said second mechanism deploys said anastomosis device.
25. The integrated anastomosis tool of claim 13, further comprising a hollow introducer tip placed at least partially into the opening in the target vessel, wherein at least a portion of said first mechanism and at least a portion of said second mechanism pass through said introducer tip.
26. The integrated anastomosis tool of claim 25, wherein said introducer tip is expandable.

27. The integrated anastomosis tool of claim 13, wherein at least one of said first mechanism and said second mechanism is at least partially lubricated with a biocompatible lubricious substance.

28. The integrated anastomosis tool of claim 27, wherein said lubricious substance is sodium stearate.

29. An anastomosis device for connecting a graft vessel to a target vessel, comprising a deployable section extending about a longitudinal axis, wherein at least a portion of said deployable section is configured to expand in two substantially orthogonal directions during deployment.

30. The anastomosis device of claim 29, wherein said deployable section is substantially annular.

31. The anastomosis device of claim 30, wherein said two substantially orthogonal directions are radial and axial.

32. The anastomosis device of claim 30, wherein said deployable section includes a plurality of expandable sections, said expandable sections having sufficient flexibility to allow said deployable section to expand both radially and axially.

33. The anastomosis device of claim 29, wherein said deployable section comprises a plurality of tines extending distally therefrom.

34. The anastomosis device of claim 33, wherein at least one said tine includes at least one tooth.
35. The anastomosis device of claim 33, further comprising at least one horn positioned adjacent at least one said tine, wherein each said horn is oriented at least partially toward said axis of said deployable section.
36. The anastomosis device of claim 29, wherein said deployable section comprises a plurality of outer flange arms at its proximal end.
37. The anastomosis device of claim 36, further comprising at least one chevron-shaped element, each said chevron-shaped element connected to two different outer flange arms.
38. The anastomosis device of claim 29, wherein said deployable section comprises a plurality of crossbars, each said crossbar connecting two adjacent outer flange arms.
39. The anastomosis device of claim 38, wherein at least one outer flange arm comprises a gripping element extending therefrom.
40. The anastomosis device of claim 29, further comprising a discard section detachably connected to said deployable section.
41. The anastomosis device of claim 40, wherein said discard section further comprises at least one connection structure at its proximal end.

42. The anastomosis device of claim 41, wherein said at least one connection structure is a paddle.

43. The anastomosis device of claim 40, wherein said discard section includes a compression segment.

44. The anastomosis device of claim 40, wherein said discard section and said deployable section are substantially coaxial.

45. The anastomosis device of claim 40, wherein said discard section comprises a plurality of spreader arms, the distal end of each said spreader arm connected to at least one outer flange arm and the proximal end of each spreader arm connected to at least one strut.

46. The anastomosis device of claim 45, wherein each said spreader arm is configured to rotate relative to the connected at least one outer flange arm upon application of a preselected amount of compressive force.

47. The anastomosis device of claim 29, wherein said anastomosis device comprises a lumen therethrough, wherein the graft vessel extends through said lumen, and wherein one end of the graft vessel is everted over the distal end of said anastomosis device.

48. The anastomosis device of claim 29, wherein said deployable section is configured to expand in two substantially orthogonal directions simultaneously during deployment.

49. A method for performing anastomosis between a graft vessel and a target vessel with an integrated anastomosis tool to which an anastomosis device is detachably connected, comprising:

placing the distal end of the integrated anastomosis tool on the target vessel; and
actuating at least one control on the integrated anastomosis tool to create an
opening in the target vessel and complete an anastomosis with the target
vessel.

50. The method of claim 49, wherein said actuating completes an anastomosis with the target vessel by deploying the anastomosis device.

51. The method of claim 50, wherein said actuating comprises serially creating an opening in the target vessel and deploying the anastomosis device.

52. The method of claim 50, wherein said deploying comprises applying a tensile force, then a compressive force, to the anastomosis device.

53. The method of claim 49, wherein a single control is actuated to create an opening in the target vessel and complete an anastomosis with the target vessel.

54. The method of claim 53, wherein said single control is a knob, and wherein said actuating comprises rotating said knob.

55. The method of claim 54, wherein said actuating comprises rotating said knob in a single direction.

56. The method of claim 55, wherein said rotating is continuous.

57. The method of claim 54, wherein said actuating comprises rotating said knob sequentially in different directions.

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